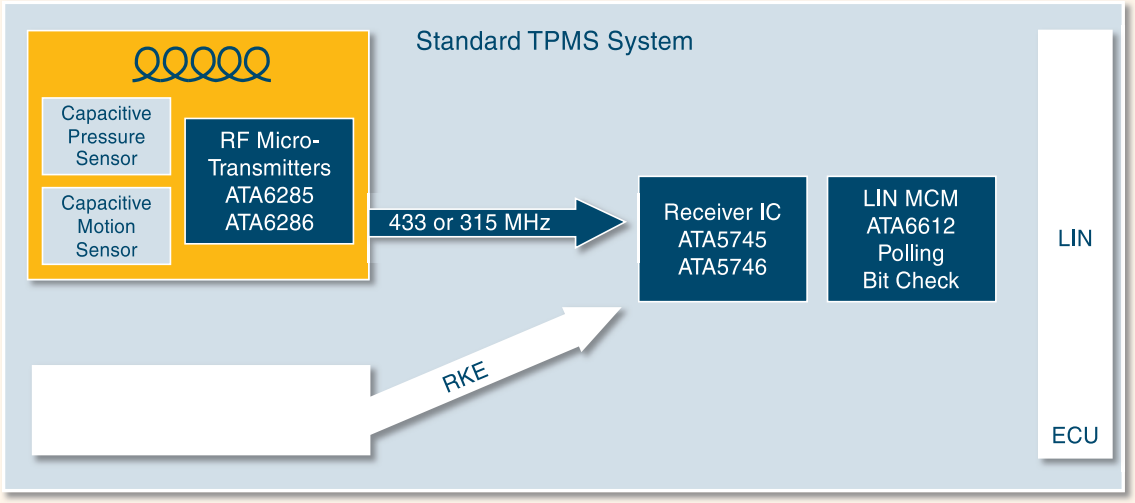
ICs for Tire-pressure Monitoring Systems

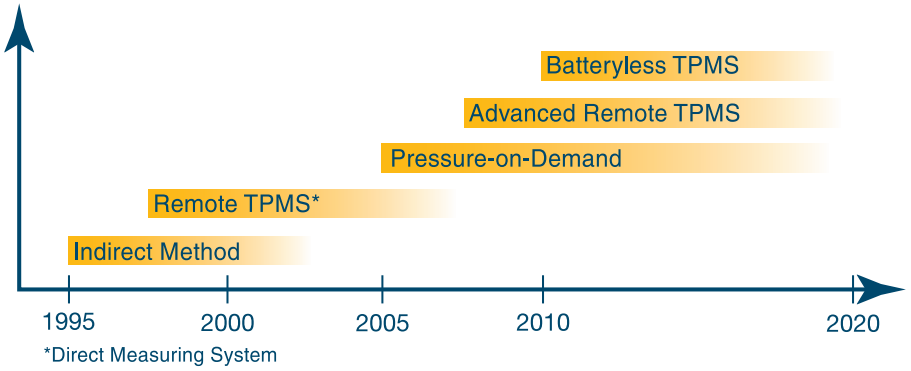
Atmel® offers highly integrated circuits for battery-powered sensor-gauge and base-station applications in tire pressure monitoring systems (TPMS). The TPMS product portfolio includes a low-power Flash-microcontroller RF-transmitter IC family to be used along with separate capacitive pressure or motion sensors, plus a broad range of standalone RF-transmitter and LF-receiver ICs that can be combined with separate microcontroller or smart sensor devices. These TPMS ICs are suitable for temperatures up to 125°C (extended storage temperatures up to 175°C), and they provide outstanding low current consumption, which helps the sensor gauges achieve 10-year longevity.

The TPMS portfolio also includes an innovative transparent RF receiver IC family with very fast switching times between RKE and TPMS signals. These ICs are capable of covering all physical functions needed for combined TPMS/RKE systems. The polling mode and bit-check functions are carried out by the firmware in a separate microcontroller device such as Atmel's LIN multichip module ATA6612 with integrated AVR®.



About TPMS

TPMS systems help to avoid accidents by warning the driver about status of the tires. TPMS is a vehicle-embedded system, which detects the tire pressure by analyzing the difference between the wheel speeds (indirect method) or by measuring both temperature and pressure (direct method).
The indirect method, in existence for over a decade, is a very low cost method; however, it has many disadvantages, in particular, that it is imprecise i.e., only one tire deflation is detectable, feasible only at 30 km/h.
Direct measuring systems, in contrast, precisely monitor all four tires during parking and driving. The detection of deflated tires is possible within a short learning time. The direct TPMS system consists of a UHF receiver in the vehicle and four sensor gauges mounted on the wheel rim/valve to sense data, calibrate pressure versus temperature, and organize data transmission to the car body.

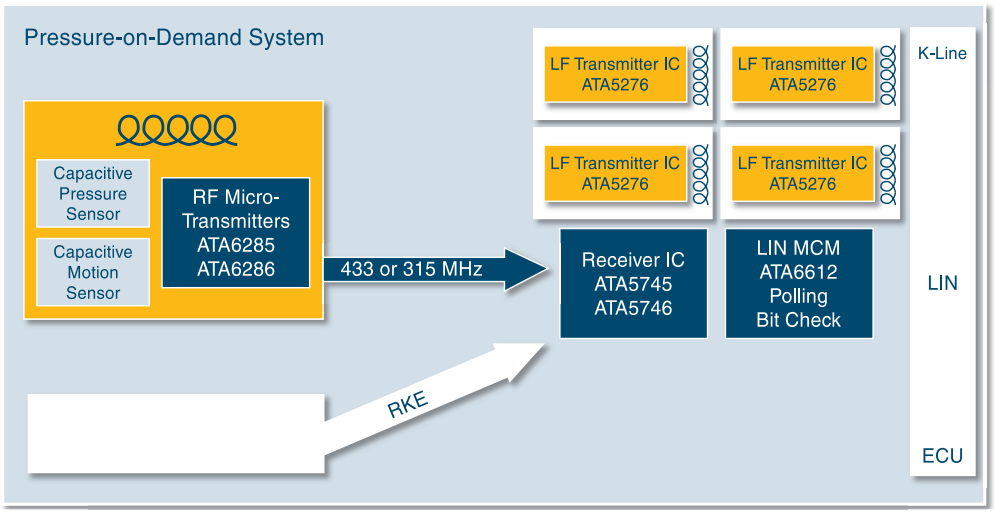


Pressure-on-Demand

A POD system includes a 125-kHz built-in channel for waking up sensor modules in defined duty cycles. Such systems remarkably increase the flexibility of wheel initialization when changing tires by reprogramming the memory. POD systems also enable autolocation functionality, i.e., they display the precise location of a deflated wheel. The driver can toggle through different modes at the dashboard.

POD System Benefits

- Display Shows What Happened and Where
- Highest Flexibility During Wheel Change
- Several Measurement/Transmission Modes
- Adjustable Current Consumption
- Master/Slave System, i.e., the Sensor Communication is Controlled to Avoid Malfunction
- No Accelerometer in the Sensor Module Necessary



Ultra Low-Power Microcontroller Transmitter ICs ATA6285/ATA6286 for Sensor Gauges

- Cutting Edge for Sleep Mode Current: 1.2 µA at 85°C with Active Interval Timer
- ATA6285: 315 MHz, ATA6286: 433 MHz
- 8 Kbytes In-system Self-programmable Flash and 320 Bytes EEPROM
- Lowest Current Consumption (0.6 µA Sleep Mode, 200 µA Measurement Mode)
- Integrates the Transmitter IC ATA5756/ATA5757 with a Dedicated 8-bit AVR Flash Microcontroller Providing Capacitive Sensor Interface, LF Channel, Temperature Sensor, and 90-kHz Slow-oscillation Mode
- QFN32 Package (5 mm × 5 mm)

Transmitter ICs ATA5756/ATA5757

- ATA5756: 315 MHz (North America), ATA5757: 433 MHz (Europe) and 448 MHz (Korea)
- Settling Time <0.85 ms Typically and Reduced Active Current Consumption for Extended Lifetime
- 3-Wire Bus Interface

Highly Flexible RF Transmitter IC ATA5749 for Single Board Design

- 315/433 MHz Operation in ASK/FSK Modulation with Single 13 MHz Crystal
- Fully Integrated Fractional –N PLL
- –0.5 dBm to 12.5 dBm Scalable Using Output Power Programming
- Active Current Consumption 7.3 mA at 5.5 dBm
- RF Frequency Channelling
- Data Rate up to 40 Kb/s (Manchester)
- Very Fast Crystal Oscillation Start-up Time (200 µm)
- Supply Voltage 1.9 to 3.6V
- TSSOP10

Transparent RF Receiver ICs ATA5745/ATA5746 for Combined RKE/TPMS Car Modules

- ATA5745: 433 MHz, ATA5746: 315 MHz
- Extremely Fast Switching Rate Between RKE and TPMS Signals: <1 ms (Typically)
- High System Sensitivity and Selectivity Can Be Achieved Even with a Low Number of External Components
- Polling Mode and Bit Check Carried Out by External Firmware

LF Receiver IC ATA5283

- World's Smallest Standalone LF Receiver IC for 125°C/257°F Systems (TSSOP8 Package)
- Ultra Low Current Consumption (1.3 µA in Listening Mode with Sensitivity of 1 mV (Typically)
- Built-in Digital AGC to Amplify Input Signal from the Coil

LF Antenna Driver IC ATA5276

- 1.5-A_{PP} Antenna Driver for 125-kHz Operation
- Frequency Self-tuning to the LF Antenna Resonance Frequency
- Built-in Diagnosis Function
- Operation Temp –40°C/F to +105°C/221°F

TPMS System Status and Trends: Battery-powered and Batteryless Systems

- Strong Trend Towards Low-cost TPMS Systems Forces Car Manufacturers to Use Low-cost (Battery-powered) Sensor Gauges
- First Vehicle Platforms Equipped with Battery-powered Bi-directional Channel LF/RF POD Systems (Autolocation Functionality, 100% Confidence Level of Pressure Monitoring)
- First Autolocation Platforms Evolve Based on Plausibility System Check Using Double-axis Motion Sensors (Advanced Remote Systems)
- Further Trend Towards Higher Integration Level of Combined RKE/TPMS Modules
- Currently No Existing Platform with Batteryless Technology, Various Approaches Still in Discussion

Part Number	Frequency Range [MHz]	Key Features	Package
UHF Transmitter ICs			
ATA5756 ATA5757	315 433	ASK/FSK UHF TPMS Transmitter ICs, From 2.0V	TSSOP10
ATA5749	315/433	ASK/FSK UHF TPMS Transmitter IC, Fully Programmable by the Microcontroller, Single-board Design for Both Frequencies with Single 13 MHz Crystal Type, From 1.9V	TSSOP10
UHF Receiver ICs			
ATA5723	315	UHF Remote Control Receiver, 300 kHz Bandwidth RSSI Pin Compatible to ATA5724, ATA5728	SSO20
ATA5724	433	UHF Remote Control Receiver, 300 kHz Bandwidth, RSSI Pin Compatible to ATA5723, ATA5728	SSO20
ATA5728	868	UHF Remote Control Receiver, 600 kHz Bandwidth, RSSI Pin Compatible to ATA5723, ATA5724	SSO20
ATA5745 ATA5746	433 315	Transparent UHF Receiver IC with Fast RKE/TPMS Switching Rate, Suitable for 1 to 20 Kbits/s Manchester FSK with 4 Programmable Bit-rate Ranges, High FSK Sensitivity (–114 dBm at 2.4 Kbits/s), High Blocking Capability	QFN24
ATA5811 ATA5812	433 315	Fast Switching Rate between TPMS and RKE Receive Modes	QFN48
LF Receiver ICs			
ATA5283	125 kHz	Industry-leading Ultra Low Power ASK Receiver IC with Minimum Current Consumption and Maximum Sensitivity	TSSOP8
LF Antenna Driver ICs			
ATA5276	125 kHz	1.5-APP Antenna Driver IC with Frequency Self-tuning to the LF Antenna Resonance Frequency and Built-in Diagnosis Function	QFN20
Microcontroller Transmitter ICs			
ATA6285 ATA6286	315 433	Single-package Microcontroller Transmitter Including 8-bit Flash AVR Microcontroller with Capacitive Sensor Interface, 125-kHz Receiver Channel, Temperature Sensor, 90-kHz Slow-oscillation Mode	QFN32
Microcontrollers			
ATAM893		4 KB Flash-ROM/32 × 16-bit EEPROM	SSO20
ATAR890		2 KB ROM/32 × 16-bit EEPROM	SSO20
ATAR892		4 KB ROM/32 × 16-bit EEPROM	SSO20

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Rev.: 4616C-TPMS-04/08/02M